EXHIBIT D

THE HONORABLE RICHARD A. JONES

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT SEATTLE

BOMBARDIER INC., Plaintiff, v. MITSUBISHI AIRCRAFT CORPORATION, MITSUBISHI AIRCRAFT CORPORATION AMERICA INC., et al., Defendants.	2:18-cv-1543 RAJ DECLARATION OF ROBERT JOHN HANSMAN JR.

I, Robert John Hansman Jr., declare as follows:

1. I am the T. Wilson Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology ("MIT") in Cambridge, Massachusetts. I am also the Director of the MIT International Center for Air Transportation. I have worked as a faculty member at MIT since 1982.

2. In my position, I conduct research in improving the safety and efficiency of operational aerospace systems as well as the design and development of flight vehicles. I also chair the U.S. Federal Aviation Administration Research Engineering & Development Advisory Committee, among other national and international aerospace advisory committees.

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Background and Experience

3. In 1976, I received a bachelor's degree *magna cum laude* in physics from Cornell University in Ithaca, New York. I earned a master's degree in Physics from MIT in 1980, and an interdisciplinary Ph.D. in Physics, Aeronautical and Astronautical Engineering, Electrical Engineering, and Meteorology from MIT in 1982.

4. I began my career at MIT as a lecturer in 1982. I became an assistant professor in 1983 and the Boeing Assistant Professor of Aeronautics and Astronautics in 1984. In 1985, I was named the Esther and Harold E. Edgerton Assistant Professor. In 1987, I became an associate professor and, in 1995, I became a tenured professor. Finally, in 2006, I was appointed as the T. Wilson Professor of Aeronautics and Astronautics.

5. Additionally, since 1982 I have consulted for numerous firms as well as organizations and governments on aerospace technology, safety, and operational topics.

6. As a faculty member at MIT I have taught courses in aircraft design, aerospace systems, flight testing, human factors, and instrumentation for aircraft and spacecraft. My research has encompassed a broad range of topics generally focused on the design and operation of aerospace systems to improve the safety and efficiency of air transportation. I have also lead the design, development, and flight testing of a number of innovative air vehicles.

7. I am a Commercial Pilot and Certified Instrument Flight Instructor with over 6,000 hours of pilot in-command time in airplanes, helicopters, and sailplanes including meteorological, production, and engineering flight test experience.

8. I hold seven patents and have published more than 300 technical papers, including contributing to five books, more than 65 journal articles, and numerous conference papers. My published books include "The Global Airplane Industry" and "Challenges in Aerospace Decision and Control: Air Transportation Systems." A complete list of my publications, along with my CV, are attached hereto in Exhibit 1.

9. I am a member of the U.S. National Academy of Engineering and the Royal

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Aeronautical Society, and a Fellow at the American Institute of Aeronautics and Astronautics ("AIAA"). I have been a Director at the Soaring Society of America, and have served on the NASA Aeronautics Advisory Council, the NAE Aeronautics and Space Engineering Board, and other government advisory committees.

10. I have received numerous awards, including the AIAA Dryden Lectureship in Aeronautics Research, the Air Traffic Control Association Kriske Air Traffic Award, a Laurel from Aviation Week & Space Technology, the Federal Aviation Administration Excellence in Aviation Award, and the Presidential Young Investigator Award.

Differences Between the CSeries and the MRJ

11. The CSeries and the MRJ aircraft are different in several fundamental respects (setting aside the differences in their multitude of component systems). Although both fall within the "transport" category of aircraft, the MRJ are smaller, with lower Maximum Takeoff Weights, and are designed for shorter routes carrying fewer passengers than the CSeries. The following table[1] illustrates just some of the basic differences between the aircraft designs[2]:

	MRJ-70	*MRJ-90*	*A220-100 (CSeries)*	*A220-300 (CSeries)*
Passengers	69 to 80	81 to 92	108 to 133	130 to 160
Length	109 ft, 8 in	117 ft, 5 in	114 ft, 9 in	127 ft
Wing span	95 ft, 10 in	95 ft, 10 in	115 ft, 1 in	115 ft, 1 in
Max Take Off Weight	88,626 lbs	94,358 lbs	134,000 lbs	149,000 lbs
Range	2,020 nautical miles	2,040 nautical miles	3,100 nautical miles	3,300 nautical miles
Ceiling	39,000 ft	39,000 ft	41,000 ft	41,000 ft

[1] A list of references supporting the information provided in the table can be found at Exhibit 2 hereto.

[2] I understand that Bombardier recently sold the CSeries to the "C Series Aircraft Limited Partnership," which is majority-owned by Airbus, Ltd. *See* https://www.airbus.com/newsroom/press-releases/en/2018/07/airbus--majority-stake-in-c-series-partnership-with-bombardier-a.html. The CSeries is now known as Airbus's A220 family of aircraft. *See, e.g.*, https://www.airbus.com/aircraft/passenger-aircraft/a220-family.html.

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Differences between Particular Systems in the CSeries and MRJ

12. I have studied the documents attached to the Burns Declaration (Dkt. 5) describing the air data systems and flap skew detection systems ("flap SDS") of the Bombardier CSeries and Global 7000 aircraft, and the document attached to the Tidd Declaration (Dkt. 7) describing Bombardier's computerized airplane flight manual calculation methodologies.

13. I have further analyzed documents describing the air data system and flap SDS of the MRJ aircraft.

14. Based on my review, I have concluded that the systems in question of the MRJ are sufficiently different from those of the CSeries and Global 7000, such that information relating to the CSeries and Global 7000 systems would not be useful in designing or certifying the MRJ systems. It is also my opinion that the documents attached to the Burns and Tidd Declarations represent a very small subset of the large number of complex systems incorporated in a modern aircraft. Therefore, the information in the documents would have extremely limited value to the design and certification of the MRJ.

Air Data Systems

15. An air data system is used to determine aircraft parameters such as airspeed, altitude, Mach number, angle of attack, side slip, and temperature from the pressures, air flow, and temperatures around the aircraft. The air data system includes the Pitot-static system to measure the two most important air pressures, namely, the forward-facing dynamic pressure, which is normally measured by a Pitot probe (basically a tube facing into the airflow) and the static pressure, which represents the ambient pressure around the aircraft, which is normally measured by static ports (basically tubes facing perpendicular to the flow). The airspeed can be related to the difference between the dynamic pressure (measured by the Pitot probe) and the static pressure. The barometric altitude can be related to the static pressure. It should be noted that the calibration of the static pressure ports can be a challenge as the shape of aircraft, particularly near the wings, along with the direction of flow (angle of attack and angle of side

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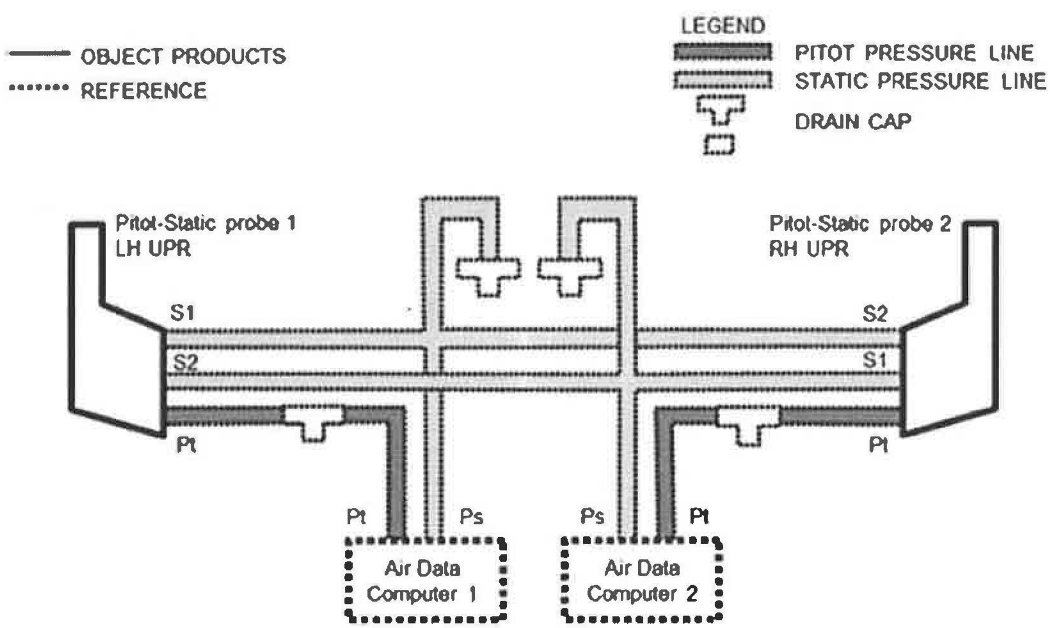
slip) changes the pressure field around the aircraft. The validation and basic calibration of the static system is normally done early in a flight test program. Many standard methods have been developed for air data system calibration. *See, e.g.*, Donald T. Ward, *Introduction to Flight Test Engineering*, at 7-34 (Elsevier, 1st ed. 1993); AC 23-8B, Appendix 9 Flight Test Guide for Certification of Part 23 Airplanes. Because temperature is related to air density, speed of sound, engine performance, and icing potential, it is also included as a measured parameter.

16. The MRJ uses a conventional air data system architecture comprising two simple Pitot-static probes mounted on either side of the fuselage and connected through pneumatic tubes to pressure sensors in the Air Data Computers, where the pressures are converted to electrical signals representing airspeed, altitude, Mach number, etc. The Pitot-static probes within this conventional system architecture do not themselves include a processor in the unit, but rather are connected to pneumatic tubes that lead to an Air Data Computer. This architecture has been used for decades, including before Air Data Computers when the pneumatic tubes connected directly to mechanical altimeters and air speed indicators. The following diagram depicts the MRJ air data system:



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17. One of the challenges in a conventional air data system architecture is that if the dynamic and static pressures are changing rapidly during takeoff or aircraft maneuvering, there will be a delay in the pressure change at the sensor (known as "pneumatic lag") due to the finite speed of the flow of air in the tube. This pneumatic lag can be important during takeoff when the airspeed is increasing rapidly and is used as a decision parameter in takeoff abort procedures. For this reason, the acceptable pneumatic and computer processing lag is defined by regulation (*see, e.g.*, 14 CFR § 25.1323(g); AC 25-7C, ¶ 177a(1)(f)) and standard test techniques have been developed to measure this lag.

18. The CSeries aircraft use a fundamentally different air data system architecture that relies on UTC Aerospace Systems ("UTAS") "SmartProbes™," which send processed electrical signals to an Air Data Computer. This is confirmed by the many references to "SmartProbes" throughout Exhibits C-H to the Burns Declaration, which describe how the SmartProbe-based systems are calibrated and have their accuracy verified. (*See, e.g.*, Ex. C to Burns Decl. at 14 ("The production airspeed and altitude measurement systems use forward fuselage mounted UTAS SmartProbes™."); *id.* at 15, 18-20, 27-36, 38-39; Ex. D to Burns Decl. at 14; Ex. E to Burns Decl. at 14; Ex. F to Burns Decl. at 14; Ex. G to Burns Decl. at 15; Ex. H to Burns Decl. at 14.)

19. SmartProbes are part of an aircraft's Pitot-static system. The SmartProbes output electrical signals (they have small microprocessors inside the unit) and do not use pneumatic tubes, so there is essentially no pneumatic lag although there may be some processing lag.

20. The SmartProbes used in the CSeries aircraft are manufactured by third-party UTAS (now known as Collins Aerospace). (*See* Ex. C to Burns Decl. at 14 (referring to "UTAS SmartProbes™").)

21. Attached hereto as Exhibit 3 is a true and correct copy of a UTAS brochure describing the SmartProbe air data system. The brochure includes the following illustration of the differences between a conventional air data system, like that used in the MRJ, and a

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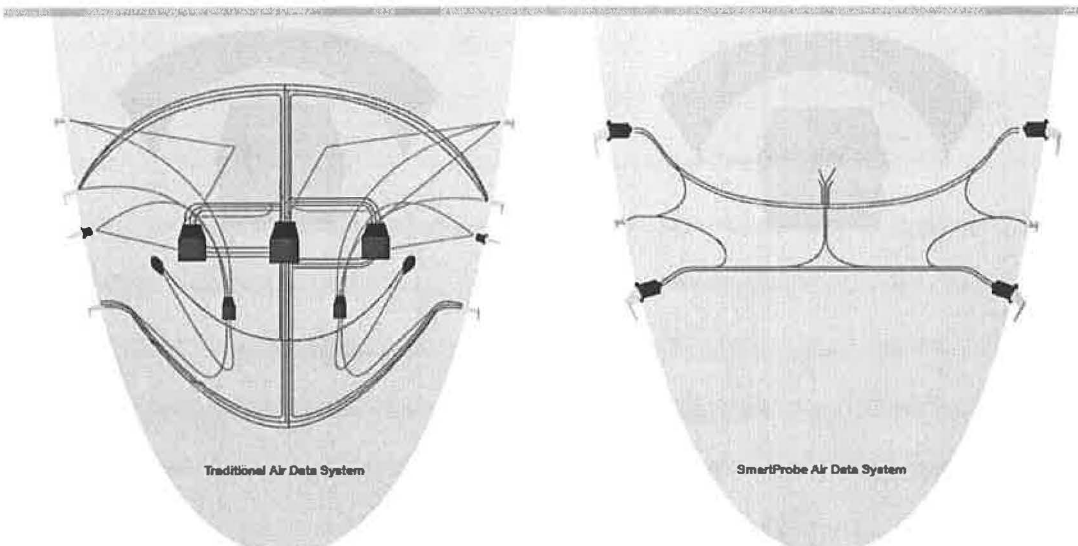
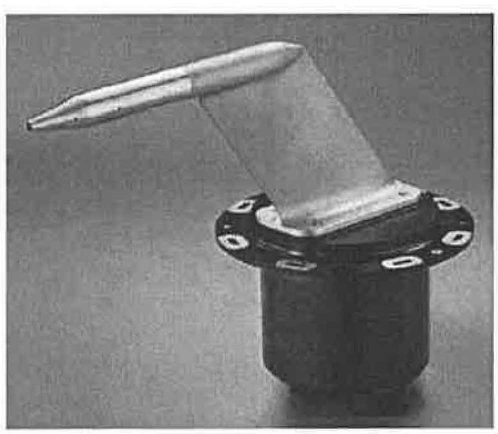
SmartProbe air data system, like that used in the CSeries (Ex. 3 at 3):



In this diagram, pneumatic tubes are represented in blue and electric paths are shown in dark gray. The traditional air data system on the left (like that in the MRJ) has both pneumatic tubes and electrical connections, whereas the SmartProbe air data system on the right (as in the CSeries) has only electrical connections.

22. Below is a photograph of a UTAS SmartProbe device (Ex. 3 at 2):



23. The UTAS brochure further describes that SmartProbes and the air data computers they use are not unique to the CSeries aircraft, but in fact have been used in "a diverse

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range of military and commercial aircraft," including aircraft manufactured by Airbus, Boeing, Embraer, and Honda, to name a few. (Ex. 3 at 4.) This is unsurprising because SmartProbes have been known in the aerospace industry since the early 1990s. They were originally developed by Rosemount Aerospace Inc. (a predecessor to UTAS). The design of the SmartProbe systems has been described in publications dating back many years. For example, attached as Exhibits 4 and 5 are two publications describing flight testing conducted between June 1992 and January 1993 that Rosemount and Deutsche Aerospace Airbus jointly sponsored, which evaluated in-flight performance of distributed multifunction air data SmartProbes. These articles further describe the SmartProbe architecture and internal operation. For anyone interested in additional details of SmartProbe operation, Rosemount also describes them in, for example, U.S. Patent No. 6,452,542 (attached as Exhibit 6). Accordingly, there is widespread and longstanding knowledge of the operation, certification, and use of such SmartProbes—not only by the third-party manufacturer of the SmartProbe product (UTAS)—but also in the public domain and among Bombardier's competitors within the aerospace industry.

24. I see nothing in Exhibits C-H to the Burns Declaration about the operation or architecture of SmartProbes that is confidential. The only potentially confidential discussions in those documents relate to how Bombardier integrates SmartProbes in the CSeries airplane, but that specific use is not applicable to the differently designed MRJ air data system architecture.

25. Bombardier's specific application of SmartProbes in the CSeries is also irrelevant to the MRJ because conventional air data systems (like the one used in the MRJ) and SmartProbe systems (like the one used in the CSeries) differ significantly: the air pressure detection devices are different, the pneumatic system is different, and the computers are different. The specific calibration data and use of that data in Exhibits C-H to the Burns Declaration could not be applied to the MRJ air data system, and thus are not useful.

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Flap Skew Detection Systems

26. The flap SDS in the Bombardier Global 7000 aircraft,[3] as described in Exhibits A and B to the Burns Declaration, is also substantially different in design and operation than the flap SDS in the MRJ.

27. Flaps are movable parts on the trailing edge of an aircraft's wings that increase the wing's lift when the aircraft is flying slowly, such as during landing.

28. Generally speaking, a flap SDS is used to monitor if the flap extends or retracts smoothly on both sides and will shut down the extension or retraction motors if a skew is detected due to a jam of the actuator or flap. By way of example, a skewed flap is like a dresser drawer that has not been pulled out straight. Flap SDS systems are a relatively recent development. In older aircraft the flaps were generally strong enough to either have a single actuator or prevent skew by having enough strength to break a jam or stop the drive motor. As flaps have become lighter and weaker it is more common to have dual actuators on the inboard and outboard sides, so a failed actuator or track jam can result in skew that causes control issues and can damage the flaps. The original CRJ design did not have a flap SDS, but one was incorporated into the CRJ after a flap skew incident in 1998. *See* AD CF-1998-14R4-E.

29. The flap SDS in the Global 7000 is similar to the CRJ flap SDS although the CRJ has a SDS only on the outboard flaps (in response to AD CF-1998-14R4-E) while the Global 7000 has a SDS on both the inboard and outboard flaps. In both aircraft, each flap panel has an inboard and outboard ball-screw actuator. The amount of extension in each actuator is measured by monitoring the rotation in the actuator screws through a magnetic sensor, which monitors the pulse from a set of six or seven magnets mounted around the screw. As the screw turns, the magnet sensor counts a "pulse" every time one of the actuator magnets passes it. The detector

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[3] The Global 7000 aircraft is now referred to as the Global 7500.

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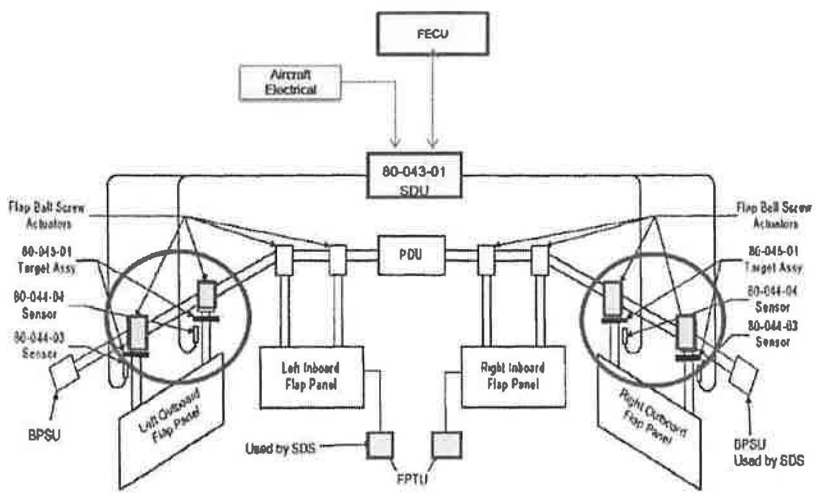
compares the number of pulses detected on the actuators on each side of the flap. If the flap begins to skew, the counts will be different. A limit to the allowable count difference can be set, so that if the allowable limit is exceeded, the flap SDS will activate a relay that shuts down the actuators to prevent further skew, and the pilots will be notified through the crew alerting system.

30. Below is a schematic diagram of the Bombardier flap SDS as implemented on left and right airplane wings of a CRJ aircraft. (*See* Ex. A to Burns Decl. at 12.) The red circles identify the locations of the actuators and sensors:



31. Below is a schematic diagram of the Bombardier flap SDS in the Global 7000 aircraft. (*See* Ex. A to Burns Decl. at 20):

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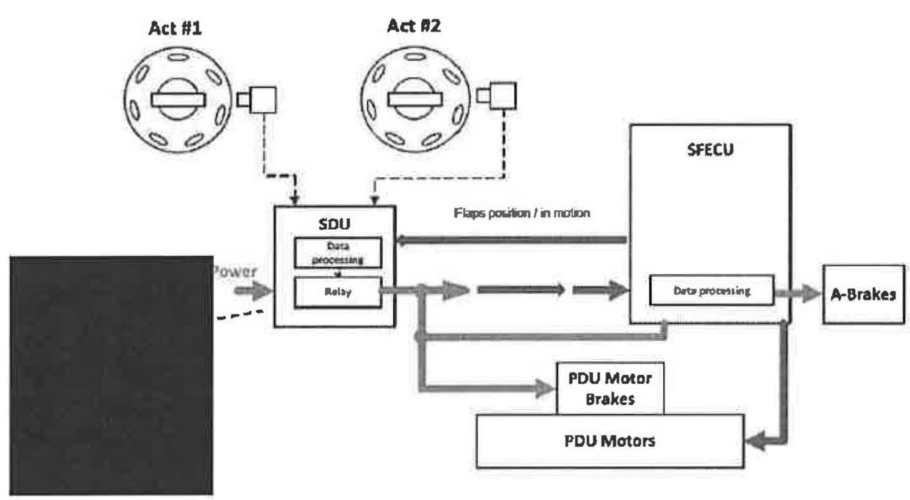
[redacted]

32. This specific system components are further illustrated in Exhibit A to the Burns Declaration, as shown below (Ex. A to Burns Decl. at 21):



33. In contrast, the flap SDS in the MRJ does not use actuators and a magnetic, pulse-counting sensor. Rather, it uses Rotational Variable Displacement Transducers ("RVDT") connected to linkages between the flap and the wing. As the flap extends, the linkages move, causing the RVDT joints to rotate, which generate an AC voltage signal related to the flap extension. There are inboard and outboard sensors on each flap, and by comparing the voltages

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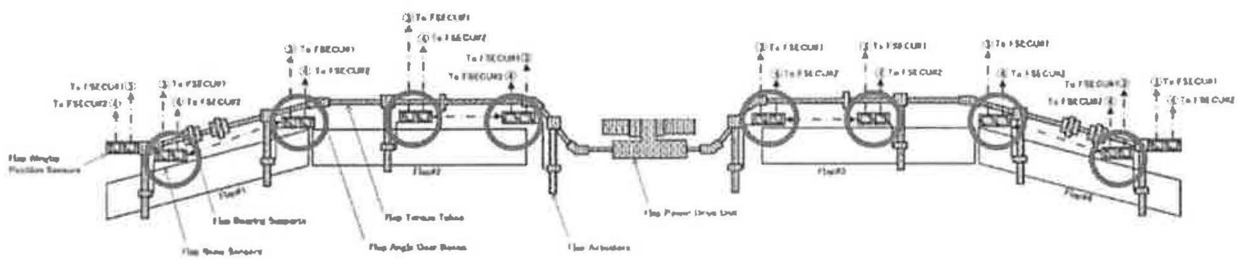
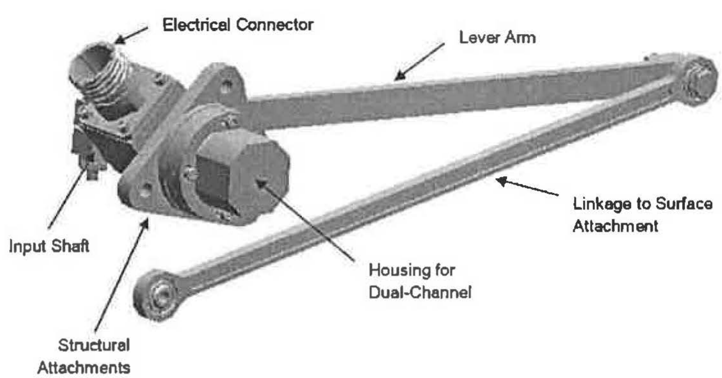
between the inboard and outboard sensors in circuits in MRJ's skew sensor interface, a voltage proportional to the skew can be detected. If the skew reaches a certain threshold, the system shuts down.[4]

34. Below is a schematic diagram of the MRJ flap SDS as implemented on left and right airplane wings. The red circles identify the locations of the skew sensors:



35. The MRJ flaps and the Global 7000 flaps have different configurations, so the MRJ's flap SDS system detects different structures than the Global 7000. Below is an image of the flap skew sensor and linkage in the MRJ flap SDS:



[4] The original flap SDS for the Global 7000 had a design similar to that of the flap SDS for the MRJ with actuators and linkages. (*See* Ex. A to Burns Decl. at 8.) But Bombardier abandoned that design in favor of the magnet design described above. Thus, the flap SDS of the Global 7000 aircraft as implemented is distinct from the flap SDS of the MRJ.

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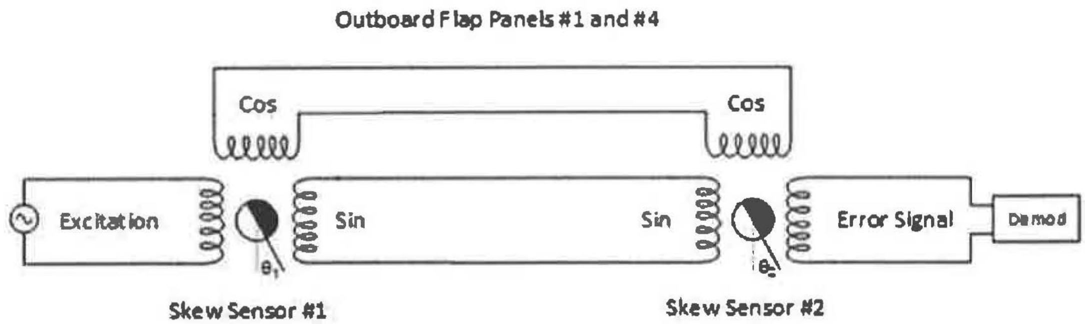
36. The following diagram illustrates the skew sensor interface of the MRJ's flap SDS system:



37. Owing to the significant design and operational differences between the ball-screw actuator flap SDS of the Global 7000 and the RVDT based flap SDS of the MRJ aircraft, information about the Global 7000 flap SDS system is not applicable or useful to the MRJ flap SDS system. Exhibits A and B to the Burns declaration thus are not useful to the MRJ.

38. Burns states that the information contained within Exhibits A and B to his declaration provides a "roadmap" for Bombardier to "design, develop, and to obtain regulatory acceptance of a future aircraft's [flap] SDS design for years to come," and that rather than having to "'start from scratch,'" Bombardier can "base future [flap] SDS designs on the information contained in [Exhibits A and B], thereby saving significant time and resources." (Dkt. 5 at ¶ 4.) But Exhibits A and B provide no such time- or cost-saving benefits for the MRJ, which employs an entirely different type of flap SDS than the Global 7000.

<u>Publicly Available Information within Exhibits to the Tidd and Burns Declarations</u>

39. The eleven documents attached to the Burns and Tidd declarations primarily contain information that is publicly available. The information that is not public is specific to Bombardier's aircraft, such that, if it had been accessed, it would not be usable on the MRJ program.

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<u>Discussion of the Disputed Documents</u>

Exhibit A to the Tidd Declaration: CAFM Calculation Methodology

40. This document describes the performance calculation methodology used in the Computerized Aircraft Flight Manual. It describes basic physics, atmospheric models, and aerodynamic methods for calculating aircraft performance that are well-known and in the public domain in a variety of textbooks (*see, e.g.*, [redacted]), or are specified in airworthiness regulations (*see, e.g.*, Airworthiness Manual Chapter 525 - Transport Category Aeroplanes) and/or certification guidance documents (*see, e.g.*, [redacted]), which are often cited directly in the document as the source or basis for the calculations. Most of the document is information that is available in the public domain. In a few instances the formulas are non-dimensionalized in unusual ways (presumably for internal computational consistency), but the non-standard conventions would not have general applicability.

41. In his declaration, Mr. Tidd cites braking coefficients as a specific example of proprietary information:

> *"For example, the coefficients and constants disclosed in the CAFM Methodology include braking coefficients. The airplane-breaking coefficient is used in rejected takeoff and in landing distance calculations. It is also used during the calculation of takeoff airspeed. The specific braking coefficient used depends on flight conditions. Bombardier's CAFM Methodology provides a different braking coefficient for dry runways, smooth wet runways, and grooved wet runways. Bombardier arrived at each one of the constants and equations used to determine the braking coefficient for each scenario through testing, research, and through highly confidential negotiations with the applicable regulatory authorities."*

(Dkt. 7 at ¶ 5.)

42. However, the constants and equations in the document he cites appear in section 6.5 to be directly reproduced from [redacted] or well-established basic physics and aircraft performance covered in the textbooks discussed above. For example, the cubic form of smooth

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wet runway breaking coefficient is identical to that in [redacted] however the constants in the equation are not given directly but appear to refer back to the public [redacted] for their interpolated values. Similarly, the coefficient for a grooved wet runway presented in the document is simply the [redacted]. Other braking coefficients are specified in the document although they also are directly linked to public sources. For example, the compacted snow coefficient of [redacted], the dry snow coefficient of [redacted]" and the standing water aquaplaning coefficients are from [redacted]

43. The formulas and methods contained in Exhibit A to the Tidd Declaration are generally standard and found in textbooks such as [redacted]); and other aircraft design and performance books. Attached hereto as Exhibit 7 is a chart setting forth many examples of information within Exhibit A to the Tidd Declaration that can be found in those textbooks and other publicly available sources. Procedures for flight testing are also detailed in many publications by the Air Force and Navy test-pilot school curriculums, as well as regulatory guidance such as Advisory Circulars.

Exhibit A to the Burns Declaration: TCAA Presentation – Global 7000/8000 Flap Actuator Jam-Disconnect Skew Detection System (SDS) for SOF and EIS

44. This is a briefing on updated requirements for a flap SDS system (which, as explained above, detects when one side of a flap becomes jammed during extension or retraction of the flaps resulting in a misalignment or skew of the flap). The system is designed to detect the skew and disconnect the flap actuator before either safety or flight control issues occur. The flap skew problem appears to be uniquely important to the Bombardier high-lift systems based on AD CF-1998-14R4-E on the CRJ aircraft. Most of the briefing focuses [redacted] Originally the flap skew limit

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[redacted]. The analysis and skew detection system descriptions, [redacted] presented in this document are relevant only to the Global 7000/8000 flap systems and would not have applicability to other aircraft.

Exhibit B to the Burns Declaration: Global 7000/8000 Flap Actuator Jam-Disconnect Skew Detection System – Shutdown Analysis

45. This is a copy of a subset of the slides that present the results of the shutdown analysis for the flap SDS. The slides appear to be identical to slides 39-44 of Exhibit A to the Burns Declaration.

Exhibit C to the Burns Declaration: Reduction of Temperature, Airspeed, Altitude and Mach Number Errors

46. This is a compliance report regarding airspeed, temperature, altitude, and Mach number as well as angle of attack and side slip errors for the CS300 indicating compliance with AWM 525/14 CFR 25 / CS 25 and [redacted] The test methods appear to be standard and the specific air data system and results are unique to the CS300 and not transferable or applicable to other aircraft. Mr. Burns admits that the overall structure of the air data systems and the use and configuration of the UTAS SmartProbes were available from public information. For example, below is an excerpt of the UTAS SmartProbe brochure (*see* Ex. 3 at 4) that identifies that SmartProbes were used on the CSeries and Global 7000/8000 aircraft (see red circles):

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SmartProbe® / Smart Port® Programs

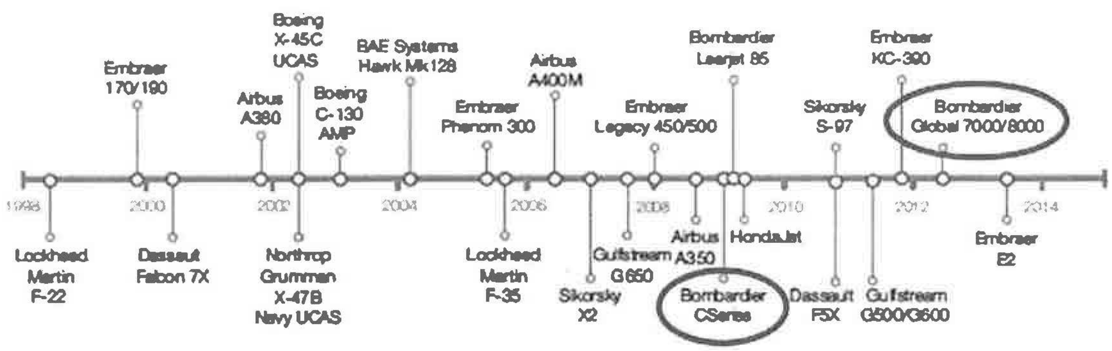

Exhibit D to the Burns Declaration: Lag Effects in the Production and Experimental Pitot-Static Systems

47. This document is a discussion of air data lag primarily to address regulatory requirements [redacted] for the CS300. The lag testing and analysis methodology is standard (*see, e.g.*, [redacted] or set by regulatory guidance, such as the requirement [redacted] The lag in the production aircraft air data system [redacted] so the report [redacted], which would be unique to the flight test aircraft configuration and would not have broader applicability.

Exhibit E to the Burns Declaration: Data Reduction of Ground Position Errors

48. This is a compliance report regarding the airspeed indication system during accelerated takeoff ground run for the CS300. The report describes [redacted] which is well-known and described [redacted]. The specific air data system results are unique to the CS300 and not transferable or applicable to other aircraft.

Exhibit F to the Burns Declaration: Reduction of Temperature, Altitude, Airspeed and Mach Number Errors

49. This is a compliance report regarding airspeed, temperature, altitude, airspeed,

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and Mach number as well as angle of attack and side slip errors for the CS100 indicating compliance with AWM 525/14 CFR 25 / CS 25 and [redacted]. The test methods appear to be standard and the specific air data system and results are unique to the CS100 and not transferable or applicable to other aircraft.

Exhibit G to the Burns Declaration: Lag Effects in the Production and Experimental Pitot-Static Systems

50. This document is a discussion of air data lag primarily to address regulatory requirements [redacted] for the CS100. The lag testing and analysis methodology is standard (*see, e.g.*, [redacted]) or set by regulation, such as the requirement [redacted] The lag in the production aircraft air data system was [redacted], so the report [redacted], which would be unique to the flight test aircraft configuration and would not have broader applicability.

Exhibit H to the Burns Declaration: Data Reduction of Ground Position Errors

51. This is a compliance report regarding the airspeed indication system during accelerated takeoff ground run for the CS100. The report describes [redacted] which is well known and described in [redacted]. The specific air data system results are unique to the CS300 and not transferable or applicable to other aircraft.

Exhibit I to the Burns Declaration: CSeries Production Flight Test Profile (Rev 5.0)

52. This document describes check-off lists used to verify aircraft and systems functionality for production flight testing before customer delivery. The check-off lists presented are specific and unique to the CSeries aircraft and are further representative of general industry practice of comprehensively checking, to the extent possible, all aircraft systems, alerts, and operational functionality. The document also includes some specific performance tables and

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engine parameter targets that are specific to the CS100 or CS300. While the title of the document indicates a fight-test profile, the document does not appear to describe a specific profile or sequence of testing.

Exhibit J to the Burns Declaration: CSeries Production Flight Test Profile (Rev 5.0)

53. This appears to be an identical document to Exhibit I to the Burns Declaration. The only apparent difference is that Exhibit I has an additional blank page at the end. As a consequence, my comments are identical to my comments on Exhibit I.

54. The information contained within the exhibits to the Burns and Tidd Declarations is either publicly known or so specific to the particular Bombardier aircraft described therein that it would not be useful to the development and certification of the MRJ. As for the Bombardier documents relating to the air data system and flap SDS in particular, those are but two of the *hundreds* of systems on a given airplane. Thus, even if information about such systems were applicable to the MRJ (which it is not), it would provide at best an insignificant benefit to the development and certification of the MRJ as a whole.

55. In my opinion, the eleven documents attached to the Burns and Tidd Declarations would have little value to an engineer seeking to gain an advantage in shortening the time for MRJ certification. Bombardier describes certification issues resulting from a need to redesign avionics wiring. The Burns and Tidd documents are useless to help resolve those issues because they do not discuss anything else related to the identification or resolution of the avionics bay compliance issues described in Bombardier's complaint.

56. The opinions and conclusions expressed in this declaration are made to a reasonable degree of certainty and are based in whole or part on my education, experience, and training in my field over the last four decades.

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I declare under penalty of perjury that the foregoing is true and correct.

Executed this 23RD day of December, 2018 at CAMBRIDGE, Massachusetts.

/s/
Robert John Hansman Jr.

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CERTIFICATE OF SERVICE

I certify under penalty of perjury that on December 26, 2018, a true and correct copy of the foregoing was served via e-mail on all counsel of record.

DATED this 26th day of December 2018.

/s/ Mary Z. Gaston
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